SCIENTIFIC MANAGEMENT[1]

NEW BRIEF STATEMENT OF ITS NATURE AND HISTORY

By H. S. Person[2]

Definition

THE term *scientific management* characterizes that form of organization and procedure in purposive collective effort which rests on principles or laws derived by the process of scientific investigation and analysis, instead of on tradition or on policies determined empirically and casually by the process of trial and error. The principal phases of scientific management are: (1) Exhaustive investigation of the elements usable in collective effort—manual and machine processes, materials, tools and equipment, physical and psychological operating conditions—and their reactions in all possible relations, in order to determine the combination which for any specific purpose is most economical in technical energy—human and material; the formulation of the results of such investigation in principles and laws and the establishment on the basis of such principles and laws of standards of procedure and result; (2) the development and maintenance of such precise and automatic coördination and control of the collective effort as to accomplish, in accordance with the established standards of procedure and result, with economy of energy and time, any purpose of the collective effort; (3) organization of the personnel, processes, materials and equipment in such functional coöperative relation as to bring to bear in the collective effort the highest available and developable technical skill in planning, supervision and execution.

A clear understanding of scientific management requires that management be not confused with administration. Management characterizes the organization and procedure through which collective effort is effected; administration characterizes those considerations and decisions which establish the purposes which create the need for management and those broad governing policies under which the management proceeds. Whether a railroad shall expend capital in further development of a main line for better service or in the acquisition of feeders for larger traffic, whether a manufacturer shall distribute through the established trade channels or through branches and stores established by himself, whether a department store shall sell trade mark merchandise or private brand merchandise, whether any institution shall operate in an extensive or a restricted area, serve a particular class of the public, establish an open or closed shop, or admit its workers to some sort of participation in administration and management, are administrative problems. These problems once settled and policies relating thereto determined by the administrative authority (which may overlap or even coincide with the management authority), managerial problems arise concerned with establishing an organization and procedure, and the conduct of such procedure, to carry out the administrative policies. This distinction between administration and management clearly in mind, it may be understood that administration is largely a process of forming judgments, may have serious social, political and other moral aspects, must be largely empirical, and can utilize in but a limited way principles and laws determined by the scientific method of investigation; whereas management on the other hand is concerned with the relations and reactions of particular forms of organization, routine, materials, equipment, and physical and psychical conditions, may proceed upon principles determined by the scientific method of investigation, and is more or less mechanistic in its nature. It may be understood also how, through absence of a clear comprehension of the difference between administration and management, and through a failure to distinguish between the nature and technical efficiency of scientific management *per se* and the administrative problems (social, political and otherwise moral) arising from its use, confusion and controversy have appeared in the public's attempt to appraise scientific management.

[1]An article prepared for the forthcoming new edition of the *Encyclopedia Americana*, and printed here by permission of the *Encyclopedia Americana*.

[2]Managing Director, Taylor Society, New York.

Early History: The System

In 1878 Frederick Winslow Taylor (1856-1915) entered the employ of the Midvale Steel Company as a laborer who had served his apprenticeship as pattern-maker and machinist. He became successively time clerk, lathe gang boss, assistant foreman, master mechanic of repairs and maintenance, chief draftsman, and in 1884, at the age of 28, chief engineer. From the beginning of this period he was in continual struggle with the workmen to increase output, which he knew from his experience as a workman was extremely low. There developed the anomalous situation, not infrequent in industry of that day, of agreeable personal relations between foreman and individual workmen accompanied by a bitter struggle concerning output between foreman and the workers as a group. Taylor, as foreman, attempted to apply the then customary foremen's method of suasion and force with the usual result of increasing the bitterness of the struggle. Concluding that he could master the situation only by knowing more than the most skilled workman about the technique of production in the shop, and about what a skilled workman should do, he applied his investigative and inventive mind (he came subsequently to hold over 100 patents) to the problem and began two lines of experiments which he pursued through many years with great thoroughness and at great expense. One related to the machine, the tool and the material (metal cutting), and the other to the workman's method of handling the machine, the tool and the material (time and motion study). The former line of experiments, continued later at the Bethlehem Steel Company, led to the discovery of high-speed steel and revolutionized the art of metal cutting (*Transactions American Society of Mechanical Engineers,* XXVIII: 1906); the latter line of experiments, greatly broadened, led to the development of a coördinated system of shop management and ultimately, as an interpretation of that system, to the formulation of the philosophy of management which came to be known as scientific management. The logical and approximately the chronological steps of the development of the system of management, essential to an understanding of the principles which came to be formulated, were: (1) Experiments leading to dependable knowledge of how long a particular machine operated, or a particular manual process performed, by a skilled workman would require to accomplish any specified result, with a given material, according to a specified most effective method of operation, and under specified working conditions. This knowledge, obtained principally by stop-watch studies of unit-time performances, permitted the setting of practicable standards per man-hour or machine-hour higher than the average of current performance; (2) The establishment of a routine of preparation and direction which would insure maintenance of the conditions under which the standards were set, which led to the working out of such mechanisms as routing, order of work, instruction cards, purchasing materials according to specifications, central stores and controlled conditioning and delivery of materials and tools; (3) The selection and assignment of personnel to machines or operations on the basis of skill and the further development of skill in workers, and (4) the establishment of specialized skilled supervision of workmen to insure maintenance of conditions and to provide instruction. These objects (3 and 4) were accomplished by functionalized foremanship, a gang boss having general supervision of the order of work in the shop, a speed boss supervising the setting up of the machine, and an inspector inspecting the product both at the beginning and at the completion of a job. (5) The constant and current checking of progress against standards by cost accounting, the data for which was derived from the operating papers; and (6) of far-reaching importance in its ultimate influence on the managerial attitude of mind, the substitution in place of the conventional "foremen's persuasion" in securing performance by workers, of voluntary application on the part of the latter through the incentive of a higher wage made possible by the increased productivity. During the years 1891-1900 these gradually developed devices became coördinated into a smoothly-working system, in which those supervisors whose duties required personal contact with workers remained in the shop, while those whose duties were in the nature of planning, preparation and control through "papers" were brought together in an office called the "planning room", adjoining the shop.

Later History: The Principles

The interpretation of this system of management in terms of principles of management seems to have been inspired by Taylor's contacts in the American Society of Mechanical Engineers, which he joined in 1886. In that year Henry R. Towne presented to the society the paper *The Engineer as an Economist* (*Transactions American Society of Mechanical En-*